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Investigating pro-environmental and active travel behaviour for successful sustainable travel promotion

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Abstract

The promotion of sustainable transport is usually targeted at transportation system users in urban areas. However, the end result of any such initiative depends largely on the recipients. Investigating people's behaviour and identifying user profiles to reveal the degree of their environmental awareness and sensitivity, as well as their attitudes towards active travelling, could shed light on the critical aspects of behaviour relevant to everyday mobility practices. This information could be used to enhance appropriate sustainable policies that presently seem to be inadequate.

This paper is concerned with recent research work which was part of a large-scale survey in the city of Thessaloniki, in Northern Greece. The survey was undertaken in the context of the implementation of a new Intelligent Transport System-ITS platform providing traveller information and enabling the selection of alternative greener routes. The work focuses on analysing possible user typologies to allow a more targeted approach and the development of properly tailored interventions for sustainable travel promotion.

From a sample of 4,815 respondents to a large scale survey of user needs, this research focused upon those who were car drivers, 3,132 in total. Following cluster analysis, a traveller typology indicated differing degrees of environmental sensitivity and active mobility. This provided information enabling appropriate interventions and policy-related actions. It allowed differentiation between several intervention audiences, the devising of appropriate incentives, and strengthening the potential of sustainable travel policies. The findings from this work, on which the initial recommendations such as integrated approaches, combining methodologies and the relevance of local context to intervention design are based, could be extended and elaborated through further research.

Keywords: travel behaviour; intervention; sustainable transport; environmental awareness; mobility

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1. Introduction

Modern life styles are heavily dependent on mobility, and travel itself is a complicated issue with a considerable environmental imprint. A major global challenge consists in reducing this impact, and discovering how to encourage and sustain individual behavioural change is a very pressing policy issue (DEFRA, 2005, 2008).

Parties with a vested interest in promoting sustainable travel, scientists, policy makers and transportation specialists lack sufficiently wide-ranging data, largely because of resource limitations. This results in constraints on effective interventions in this field. Meanwhile, current policy and practice on transport issues are subject to extensive criticism. The evidence indicates that existing environmental policy tools (economic, technological, regulatory, and informative ones) are inadequate to achieve desired goals such as greenhouse gas emission reduction (OECD/ITF, 2008). Public policy planning processes seemingly lack the tools and understanding of cooperative behavioural change processes (Australian Public Service Commission, 2007). Although aimed at changing unsustainable behaviour patterns by changing people's habits, they neglect the complex psychological mechanisms motivating travel choices that have recently been revealed (Seethaler and Rose, 2003; Ulleberg, 2004).

Promoting the adoption of new practices to achieve 'sustained behaviour change' represents a major challenge. Given that little is known about the effects of interventions aimed at social benefits (better health, environmental performance and sustainability) (Ogilvie et al., 2010), a new approach may help explore such effects by investigating putative determinants of population travel behaviour.

Urban policy should be based on scientific evidence, and, in transport science, it is agreed that infrastructural factors (e.g. service provision) have a major impact on mobility behaviour because they determine behavioural options (Hunecke et al., 2007). However, these are not the only determining factors, since socio-demographic characteristics (e.g. age, employment status) and attitudinal factors;(values, norms, and attitudes) also affect preferences for specific activities, travel destinations, routes and means (Anable, 2005; Anable & Gatersleben, 2005; Bamberg & Schmidt, 2001, 2003; Heath & Gifford, 2002; Hunecke, Blöbaum, Matthies, & Höger, 2001; Steg, 2005; Steg, Vlek, & Slotegraaf, 2001). As recent socio-psychological research suggests, attitudes are powerful determinants of human actions (Gupta and Ogden 2006, Kollmuss and Agyeman 2002) and taking these into account is crucial for the success of environmental policies (Nilsson and Kuller 2000). Consequently, reconsidering conventional transport policy approaches, by involving new practices focusing on traveller characteristics and behavioural patterns, has a significant potential to effect positive change, something already recognized by many organizations dealing with policy planning issues (Anable et. al., 2006; Nilsson and Kuller, 2000). This could make sustainable mobility a more attractive option by using soft policy measures such as public awareness campaigns for sustainable mobility and social marketing for public transportation (MacFadyen et al., 1999).

Designing such policy interventions requires knowledge of users' motivations, and any promotional strategy should include in-depth analysis of the target audience to maximize its impact.

2. Behavioural issues and effective promotion of sustainable travel

The suggested approach is about effectively putting the user at the centre of mobility policies, as argued by European guidelines (European Communities, 2001), after exploring the target audience in terms of behaviour and lifestyle. Identifying travellers' specific attitudinal attributes, like active and pro-environmental behaviour, produces a useful picture of social marketing segmentation with considerable potential for use in achieving sustainability (Geller, 1989; McKenzie-Mohr, 2000). As a concept, social marketing: "underscores the importance of strategically delivering programs so that they target specific segments of the public and overcome the barriers to this segment's engaging in the behaviour" (McKenzie-Mohr, 2000, p. 594). With the emergence of market-orientated approaches to public participation in environmental issues, current social marketing policies seek to encourage behaviour

change amongst citizens. This is done by using the concept of "sustainable lifestyles' and identifying population segments with similar commitments to environmental practices as the basis for behaviour change initiatives (e.g. Barr et al, 2011). As McKenzie-Mohr (op.cit.) suggests, knowledge about the motivational basis of target groups can be used to design interventions to promote sustainable behaviour more efficiently. This psychological insight into the public policy process allows the attitudinal-behaviour gap that exists in the traditional transportation planning to be minimized. This results in higher levels of public acceptance and engagement in the activities being promoted, and a greater likelihood of more successful policy outcomes.

Recent attempts at user profile formulation have contributed to deepening our knowledge of market segmentation, enabling the formulation of more people-oriented transport policies (Pronello and Camusso, 2011). Empirical findings indicate that combining psychological factors with socio-demographic and infrastructural variables can improve predictions of different aspects of mobility behaviour (VanWee et al., 2002). Attitude-based approaches can not only provide important information on measures aimed at reducing greenhouse gas emissions at an aggregate level, but also on different aspects of mobility behaviour, especially travel mode choice (Hunecke et al, 2010). According to the CAMPARIE project (2001), the value of efficient communication by targeting campaigns on specific groups after exploring their respective characteristics has been repeatedly highlighted as a factor improving the effectiveness of public awareness initiatives.

Moreover, integrating behavioural issues into the overall promotion process, such as identifying sustainable travel initiatives' potential supporters, could be a valuable step for resource saving. For instance, using identified user needs to develop new transport services for greener and healthier commuting could reduce the possibility of having to use costly incentives to attract different user groups.

Effective interventions require systematic planning and development. A concise planning model involves needs assessment, gathering both quantitative (e.g., literature review, surveys) and qualitative information (e.g., from questionnaire surveys or in-depth interviews) (Helmink et al., 2010). Needs assessment starts by reviewing mobility and quality of life as well as personal (i.e. user-related) and environmental factors involved in existing lifestyles together with empirical evidence on existing primary mobility interventions. The second step should be to explore the determinants of active lifestyle adoption and pro-environmental actions performance and their interface with sustainable travel behaviour. Subsequent steps involve the development of a prototype for the intervention, piloting this and finally evaluation.

In the context of a broader effort in the filed of successful interventions for sustainable travel promotion, this paper provides specific information on recent research using a large-scale survey in the city of Thessaloniki, in Northern Greece. It details an attempt to add an attitudinal dimension to a revealed preferences approach for the identification of users' needs. This adds a different perspective; the key methodological implication being that even a small component of qualitative research in the baseline phase of an intervention study can generate explanations, insights and hypotheses absent from the main body of quantitative data (Ogilvie et al., 2010). Quantitative and qualitative methods can be combined in various ways, and this study introduces a new perspective for explaining quantitative findings in Greece concerning the relationships between active travel, environmental sensitivity and mobility management, by studying qualitative attributes. It gives rise to new hypotheses (e.g. concerning specific behavioural aspects) to be further explored in a longitudinal qualitative analysis, and tested in a longitudinal quantitative analysis for optimizing sustainable travel promotion.

3. Methodology of research

A large scale travel survey was undertaken in the city of Thessaloniki, in Northern Greece, concerning a new ITS platform providing traveller information and enabling alternative routes selection using environmental criteria. Our research aimed to test the possibility to extract attitude-based parameters out of this initially strictly quantitative approach, even without psychometric techniques. In the frame of mobility pattern recording, the present study attempts to establish possible user typologies. Exploring targeted user lifestyles from a sustainable travel perspective aimed at revealing attributes, such as physical activation and environmental sensitivity, possibly involved in travel perceptions and practices. These attitude-based user typologies could then be targeted to stimulate more sustainable travel within a more focused approach using properly tailored interventions for sustainable travel promotion.

The study area was chosen on the basis of spatial and aggregate socioeconomic characteristics of the Thessaloniki Metropolitan Area. Only adults were surveyed in a random sample of households in these areas using a telephone questionnaire method. The questionnaire form included items on demographic and socioeconomic characteristics as well as perception related questions about local environment, travel behaviour and physical activity, as well as travel information needs. The survey was designed to investigate users' needs in terms of travel information for greener travel in the city. It was not designed to be analysed using acknowledged behavioural theories, as in other studies where, for example, the Theory of Planned Behaviour was the theoretical framework used for the selection of attitudes in segmentation processes (Anable, 2005; Hunecke et al., 2010). However, although our proper work following the large-scale survey was focused on the investigation of attitudes towards active travel and the environment, the data obtained proved well suited to behavioural analyses. Respondents were also invited to return an 'opt-in' consent form allowing us to approach them for a follow-up interview, which will follow this first step of attitudinal approach.

The sample was drawn from the resident population, considering age, occupation, and residential location. Only people over 18 years old were considered, this being the minimum age in Greece for a driving license. Respondents were grouped into 6 age ranges: (1: 16-24 years old, 2: 25-34, 3: 35-44, 4: 45-54, 5: 55-64, and 6: 65 years old and over). With respect to occupation, respondents were classified into 8 groups: self-employed persons, businessmen/ shopkeepers, public and private employees, students, housewives, retired and unemployed people. Respondents' residential location was taken into account to allow consideration of urban density, distance from central business district(CBD), average income and public transport availability. The administrative structure was used as a basis and the sample was classified on the basis of the 33 municipalities included in the study area (18 within Thessaloniki municipality and 15 in the suburbs). Following a recent reform in the Greek local administration system, the area now consists of 14 new municipalities.

The main study instrument was a comprehensive mobility and users' needs survey with an initial sample of 5,000 people. This produced 4,815 valid questionnaires. When these were filtered for driving license possession, a sub-sample of 3,132 respondents resulted, 65% of the original respondents. The sex distribution was 1,393 men and 1,739 women. Together with socio-demographic and economic characteristics, the survey questionnaire measured levels of reported practices of sustainable behaviour at home, daily travel patterns, and a range of attitudes towards certain modes of transport and environmental sensitivity in general.

The Hierarchical Clusters Analysis method was applied to develop a typology of travellers. The Benzecri's X^2 distance (Benzecri, 1992) was used as a measure of dissimilarity between travellers and Ward's criterion (Hair et al., 1995) as a method of cluster formulation. Hierarchical Cluster Analysis was performed with CHIC Analysis v.1.0 (Markos et al., 2010). All other analyses were accomplished using SPSS v.15.

Seven questions were selected from the extended survey questionnaire to elaborate the cluster analysis, including driving license possession (filter question for the sub-sample formulation). The different

questions/attributes, used in the cluster analysis refer to the following concepts: Q8-Greener route intention; Q9.1-Public transport use intention; Q9.2-Bicycle use intention; Q11-Car dependence. Questions were measured on a 5 level Likert type scale from "not at all" to "very much" (not at all, a bit, enough, much, very much). Additional questions were Q12-Time allocation to physical activity/active travel, measured on a 5 level scale from 10-19 minutes per week up to >2 hours and Q13 (total activity)-Pro-environmental activation, was recorded in a Boolean format (1 or 2), being the aggregated form of several questions regarding different pro-environmental activities (1 stands for no environmental activation, 2 for a certain environmental activation). The whole cluster analysis approach attempts to associate attitudes and potential behaviour with specific attributes characterizing the different clusters-groups respondents fall into, and consequently to guide/suggest policy makers to select the right measures and initiatives to achieve policy goals.

4. Analysis Results

The purpose was to test whether attitudinal attributes can be considered in identifying a pool of travellers' types that could be the target audience for relevant policies. To this end, an effort was made to use the appropriate information to assist the design and implementation of interventions towards Travel Behaviour Change. The above mentioned treatment of the drivers' sample derived from the large scale survey produced the results that follow..

The analyses revealed three clusters or types of travellers. A first level profile was attributed to those travellers' types with different degrees of environmental sensitivity and active mobility. In a second step, the clusters were examined in relation to socio-demographical characteristics. Each of the three clusters represents a specific combination of attitudes, lifestyles and preferences, indicating a unique profile. Table 1 displays the first level profile based on these constructs (mean values and cluster sizes). For each variable, the coefficient of determination R^2 and the corresponding observed significance level (P-value) are also reported in Table 1.

Table 1: First level profiles of travellers' types (mean values of attributes)

Types Attributes	T1	T2	T3	R^2	P	Total
Greener route intention	3.3 c	3.5 b	3.7 a	0.007	<0.001	3.5
Public transport use intention	3.4 b	3.4 b	3.7 a	0.007	<0.001	3.5
Bicycle use intention	2.7 a	2.0 b	2.6 a	0.041	<0.001	2.3
Car dependence	2.4 c	3.0 a	2.7 b	0.026	<0.001	2.8
Time allocation to physical activity /active travel	4.1 a	2.1 c	2.8 b	0.446	<0.001	2.7
Pro-environmental activation	1.0 b	1.0 b	2.1 a	0.841	<0.001	1.2
Typology identification profile	Active travellers	Non-active travellers	Active and pro-environmental travellers			
Type size (people)	727	1806	599			

For each attribute, mean values followed by different letters, are statistically significantly different at P<0.05, according to the results of a series of Mann-Whitney tests.

The most important attributes in determining clusters were the ones of "pro-environmental activation" (R^2=0.841) and of "time allocation to physical activity or active travel" (R^2=0.446), while the rest were less significant.

The first type (T1) contains 727 individuals, 23.2% of all respondents. As shown in Table 1, this group scores highest on active and physical activity practices, whilst being the least car dependent group. It is also important that this group has the highest intention to use a bicycle score among the three groups, whereas greener route and public transport use intention do not differ significantly from those of other groups. The persons forming this group show a high preference for active modes and seem to have a more active lifestyle. It can be assumed that these individuals perceive travel not only as a means to reach a certain destination, but also as a way to derive a certain benefit in terms of a healthier lifestyle. Cluster 1 can be labelled "active travellers".

The second type (T2) forms the largest group, including 1806 individuals (57.7%), and shows the highest score for car dependence, even though this factor is common to all the groups. At the same time, this cluster reflects the lowest importance given to physical activity or active travel practice. The time allocated to physical activity seems to be the crucial attribute in differentiating the second group from the first since they show similar values regarding intention for public transport use and greener routes choice, as well as in their environmental activism. These individuals show a marked lack of interest in cycling, producing the lowest score in intention to use a bicycle. They seem attached to a mode offering the most in terms of comfort perception and the least in effort required to reach the destination. The lack of any active character in their trips, and in their lifestyle in general, makes them "non-active travellers".

The third and last type (T3) is the smallest, numbering 599 respondents (19.1%), characterized by high scores both on active travelling practice and greener travelling intention, and the highest value for environmental activism for any of the three clusters. These respondents, although their car dependence is not negligible, place a high value on lifestyle improvement through a change in behaviour. They tend to shift to greener modes, being already the most sensitized towards the environment as a whole. These individuals can be labelled as "active and pro-environmental travellers", in short "pro-active travellers", as a more sustainable lifestyle is considered a desirable end in itself. To provide supporting evidence for these categorisations, additional criteria based upon deeper information on the population, through descriptive and inferential analysis of other statistical data at regional level, were used.

In brief, the active travellers were younger, 55% of the group being between 18-44, with the gender ratio being almost 50-50%, while the "pro-active" ones were middle-aged people, with almost 60% between 35-54 years old and with 57% of the group being female. Regarding the non-active travellers who made up the majority, they have a similar sex ratio to the previous group (57.6% female respondents), and more than 70% of them also come from the 35-54 year old age group, which seems to confirm that younger people tend to do more physical activity and have more active lifestyles. It is quite likely that with age individuals become more aware of and more sensitized to environmental issues. As regards the finding that the majority of travellers are non-active, neglecting physical activity in their everyday lives, this appears to reflect our current society, and is in line with recent relevant research. According to WHO (2002), more than a third of Europeans are not sufficiently physically active.

5. Discussion

The analysis of the data and extraction of user typologies was really enlightening regarding the number of different target groups for any promotional strategy in parallel with the launching of an Urban Mobility Centre to host the new ITS platform for sustainable travel in Thessaloniki. These typologies could be a useful tool and are in accord with recent research highlighting the usefulness of attitude-based target groups in predicting the ecological impact of mobility behaviour. When compared with categorisations based on socio-demographic and geographic factors, the predictive power of the attitude-based approach seems more effective, especially with regard to the use of private motorized modes of transportation (Hunecke et al., 2010). As already mentioned, this initiative is in contrast with traditional approaches to

transportation issues, which neglect attitudinal factors involved in making travel choices. However, by enriching analyses of sustainable travel behaviour and producing useful categories for evaluating daily mobility, it confirms the value of investing in environment related mobility needs and in efforts to meet these in a sustainable way.

Meanwhile, investment in sustainable policies must also be cost effective. With behavioural change in mind, such policies require concrete analysis of multiple determinants to formulate appropriate interventions. Analysing the context of behaviour, the degree of acceptability of a certain measure and the degree to which behaviour may be changed, are all prerequisites for designing effective interventions. The interface between the acceptability of a policy and its effectiveness should also be considered. As OECD (2004) suggests, it is essential that practical interventions are compatible with diagnoses of target group behaviour. This involves considering the need for behavioural change, studying present behaviour, identifying desirable behaviour and the target groups for behavioural change. The timing, the extent and the proper stimulation required for that change must also be decided.

The promotion of sustainable lifestyles has many dimensions. In the Greek context, there has so far been limited application of ideas combining the areas of physical activity and environmental sensitivity. The results of the present study confirm that such factors could be applied to travel choices. Pro-environmental and active travel behaviour investigation could be enhanced by findings from other disciplines (physical and environmental sciences), and successful interventions in these fields can empower mobility policies. Health, environment and mobility issues, all of which are important sustainability attributes, should be routinely addressed in an interdisciplinary context, with investigating user attitudes at the forefront.

Incorporating these new perspectives can contribute to the success of transportation policies since they take into account complex psychological aspects of travel choices. Furthermore, they may provide alternative tools for problem solving with regard to different user groups, and facilitate voluntary behaviour change. Higher rates of policy success should stem from the comparative advantages of sustainable behaviour, high level of synergy through stakeholder involvement, careful consideration of the responses of particular groups through piloting and transcending more conventional promotional activities. Public understanding and engagement in the activities being promoted activities can contribute to more effective transportation policies.

6. Conclusions and Recommendations

New work in the field of attitude-based mobility research could guide policy-making. Of course, there are caveats to be considered regarding differences in socio-demographic characteristics, and other aspects where transferability between different contexts requires caution. However, by benefitting from the experience and knowledge of other countries and borrowing methods from other scientific fields, we have arrived at some initial findings that warrant making some recommendations.

This is the first time work of this nature has been done in Greece and few similar efforts exist across the EU. There is a pressing need for more projects of this kind. Integrated approaches are needed from the initiation of travel study research projects and both the qualitative and quantitative dimensions need appropriate and adequate consideration.

The present research represents an initial attempt at attitudinal user categorisation. The resulting clusters are informative and policy relevant, highlighting the importance of attitudinal items. The typology developed could be included in a social marketing plan for sustainable travel promotion. Careful consideration of user attitudes and beliefs, barriers and benefits facilitates sustainable behaviour change and helps ensure long-term results. Nevertheless, this still requires substantial investment in terms of time and money coupled with constant adaptation to the area-specific context and future theoretical developments. Consequently, further work is needed in refining the results elaborated so far. Tested behavioural scales can be used for this purpose to improve cluster definition, following the careful choice

of appropriate tools. Tested scales based on behavioural theories recognizing the psychological aspects of human behaviour could be adapted to the mobility perspective. All these could enrich the methodology applied and might provide valuable additional perspectives.

A research study designed to fit the local context with both, intervention and control groups, will be necessary. The persons from the defined clusters have to be divided randomly between intervention and control groups to ensure a randomised control trial. This study could be a focused effort for investigating attitudes towards sustainable travel and testing the appraisal of targeted initiatives for its promotion.

Implications for further research could cover further theoretical development of active and pro-environmental travel behaviour within a social marketing approach. This would need to explore the strengths and weaknesses of this approach as well as the efficacy of attitudinal segmentation techniques. Research of this nature could identify other innovative elements of user behaviour. If such an approach could be used to make traditional transportation planning more congruent with the needs of users, the success rate of existing policy packages would be improved.

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